The Management of Chylothorax

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• **Chylothorax is readily diagnosed from the characteristic qualities of the effusion. Treatment should initially be conservative, consisting of multiple aspirations followed, if necessary, by suction drainage.**

Approximately half of the patients will not respond to these measures, and direct ligation and division of the duct is necessary for cure. This operation is most readily carried out through the right chest, the thoracic duct being ligated just above the diaphragm. In cases in which the duct is surrounded by tumor, radiotherapy to the mediastinum is often successful in controlling the reaccumulation of chyle, but irradiation is generally not recommended until after a tissue diagnosis has been made by thoracotomy.

Nutritional problems are often concomitants of chylothorax.

IN ELEVEN YEARS the problem of chylothorax has changed from one in which half the patients died to the present low mortality rate. This pronounced improvement in prognosis is the result of better understanding of both the nonoperative and operative treatments of the condition.

Chylothorax may be defined as the presence of chyle in the free pleural space and can be divided into two groups, spontaneous and traumatic. The spontaneous cases are usually, although not invariably, associated with fatal disease, such as lymphosarcoma, Hodgkin's disease, carcinomatosis or severe tuberculosis.[8] It is believed that in such cases the tumor invades the duct wall, permitting leakage of chyle. This theory is made more credible by experimental and clinical studies that amply demonstrate that chylous effusion cannot be produced by mere ligation of the thoracic duct.[3] Cases of spontaneous rupture not due to invading diseases are rare and the cause is thought to be fixation of the duct so that it may tear with sudden extension of the spine upon severe coughing.

Traumatic cases of chylothorax may be due to penetrating injury, such as gunshot or knife wounds, or to nonpenetrating injury, such as concussion of the chest. As the number of thoracic operations has increased, more cases secondary to accidental surgical division have appeared. Damage to the thoracic duct has been reported during many intrathoracic operations, notably dorsal sympathectomy, esophagectomy, and various vascular procedures. Chylothorax has also frequently been reported secondary to operations in the neck, particularly on the left side.

The anatomic structure of the thoracic duct may be described briefly as follows: The duct begins in the abdomen as the cisterna chyli, a globular structure 3 to 4 cm. in length and 2 to 3 cm. in diameter that overlies the first and second lumbar vertebrae. The duct consists of a single main trunk in about 40 per cent of cases; in the remaining 60 per cent it is double or multiple for at least part of its length. The duct overlies the bodies of the vertebrae between the azygos vein and the aorta as it ascends in the thorax. In the upper thorax it crosses to the left and empties into the left jugular-subclavian veins. An accessory thoracic duct drains the right side of the head, neck, and upper thorax, and empties into the right jugular-subclavian veins. Valves in the duct are 4 to 8 cm. apart in the upper portion and are generally absent below the sixth thoracic vertebra. These valves are competent and prevent retrograde injection from above. Microscopically the duct differs from veins of a similar size in that it is more muscular and the layers of the wall are less sharply defined.[3]

Diagnosis of chylothorax is made by the character of the effusion. The fluid is milky in appearance and may be pink from small amounts of red cells. It is sterile, odorless and contains abundant lymphocytes. The contained fat droplets may be seen microscopically and can be stained with a lipophilic dye such as Sudan III. The emulsion may be cleared by shaking with ether.[7] The fluid is bacteriostatic.[5] To absolutely identify the effusion lipophilic dyes may be given by mouth. The dye will later be seen in the effusion if it is truly chyle. A green dye is recommended, since its color will contrast with any normal constituent of the effusion, such as blood.[4] The most convenient way to give these dyes is to mix them with butter and serve the mixture in a sandwich.

Nonoperative treatment should be tried first, since simple aspiration of the chest will suffice in about half the cases. Thoracentesis is done as often as is necessary to keep the chest reasonably empty and

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to prevent dyspnea. Cure of the effusion probably results from obliteration of the pleural space rather than from actual healing of the rent in the thoracic duct. If chyle continues to reaccumulate after a period of ten days of aspiration treatment, closed catheter drainage of the pleural space should be tried.[7,9]

Surgical intervention is indicated if closed drainage fails after a period of two weeks. Although several techniques have been described, such as anastomosis of the thoracic duct to the azygos vein,[1] and direct repair of the duct,[9] it has been amply demonstrated that simple ligation of the duct just above the diaphragm can be curative. The thoracic duct is most readily approached through the right chest, and it can be most easily identified if fat is administered through a Levine tube several hours before operation. At the level of the diaphragm, the duct overlies the vertebral bodies and is found between the azygos vein and the aorta. To be certain that a double channel of ducts does not exist, an x-ray film of the chest is made with portable equipment at the time of operation after injection of the duct with a radiopaque medium, such as 5 to 10 cc. of Urokon.®[10]

If the effusion is on the left side, with possible encasement of the lung by fibrin, a left thoracotomy approach to the thoracic duct may be indicated in order that decortication may be done at the same time. However, it should be emphasized that the left approach to the duct may be difficult because of the presence of the descending aorta, which often necessitates the ligation of several intercostal arteries in order to reach the duct. A short section of the duct should be excised for histologic examination to make sure it is the thoracic duct and to look for possible malignant invasion. If accessory or double ducts are seen in the previously mentioned ductogram made at the operating table, they also should be ligated and divided.

Because of the large fat and protein content of chyle and the rate of reaccumulation in many cases of chylothorax, nutritional problems may develop. Obviously a high caloric, high protein diet is desirable. In addition, some investigators have reported reinfusing, intravenously, the chyle removed by thoracentesis from debilitated patients.[2,6] However, anaphylactoid reactions, with even death, have been recorded with such reinfusions and the procedure is not recommended.

Although one might have some reluctance to operate in cases of spontaneous chylothorax, particularly in cases caused by malignant disease, operation is often worth while as a palliative measure to stop the constant reaccumulation of chyle in the chest. The following cases illustrate various problems encountered in dealing with chylothorax.

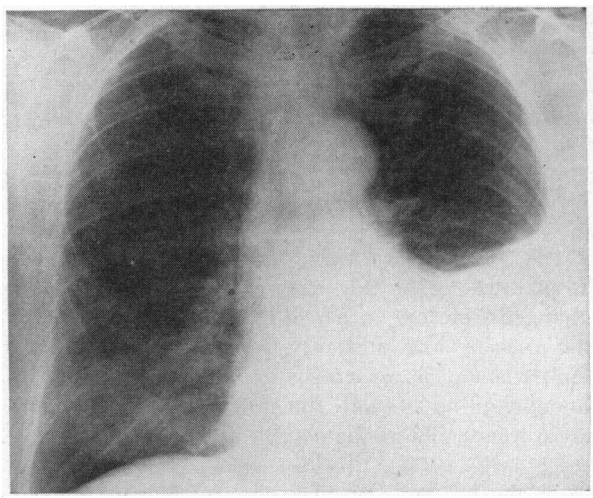

Figure 1 (Case 1).—X-ray film showing left pleural effusion before thoracentesis.

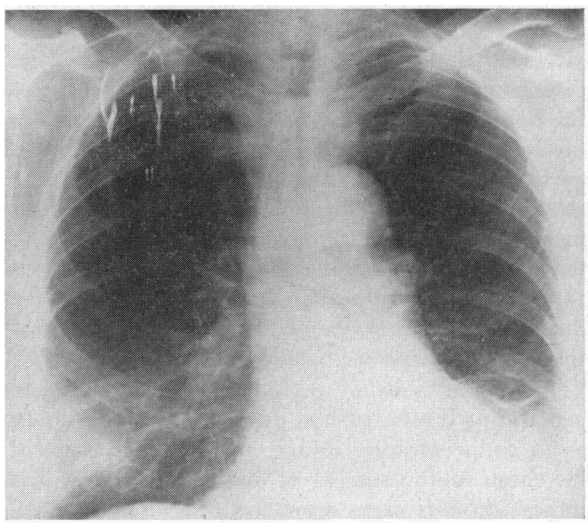

Figure 2 (Case 1).—X-ray film of chest following ligation of thoracic duct showing continued presence of a moderate amount of chyle.

CASE 1. A 70-year-old man had undergone treatment for carcinoma of the prostate six years previously. A month before admittance to hospital, dyspnea, general edema, and left pleural effusion (Figure 1) were noted. Multiple thoracentesis produced 9,700 cc. of chylous fluid. Milk and cream were given by mouth, and a few hours later right thoracotomy was performed. The thoracic duct was divided and ligated. No accessory ducts were seen, but ductography was not done. The chest was dry for two weeks but then chylothorax recurred (Figure 2), and intercostal tube drainage was done. This diminished the amount of fluid and the patient was able to go home with the tube in place. His condition gradually deteriorated and he died of widespread malignant disease a month later.

Comment: Although no postmortem examination was obtained, the chylothorax in this patient, without much doubt, was secondary to invasion by neo-

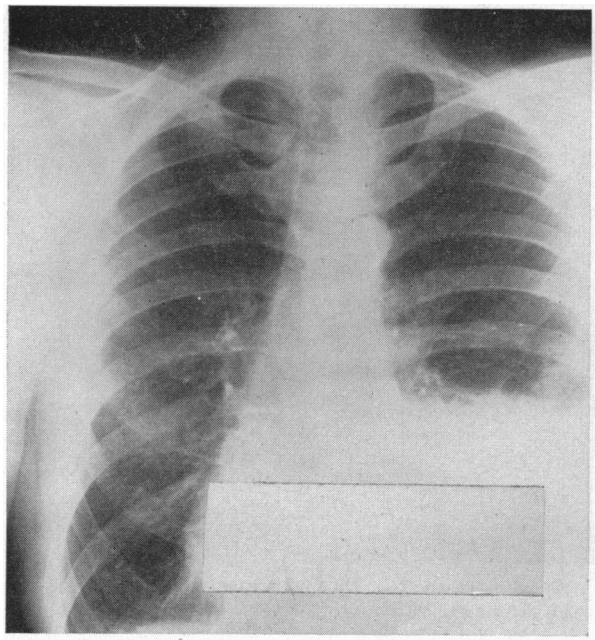

Figure 3 (Case 2).—Preoperative film of chest showing left chylothorax.

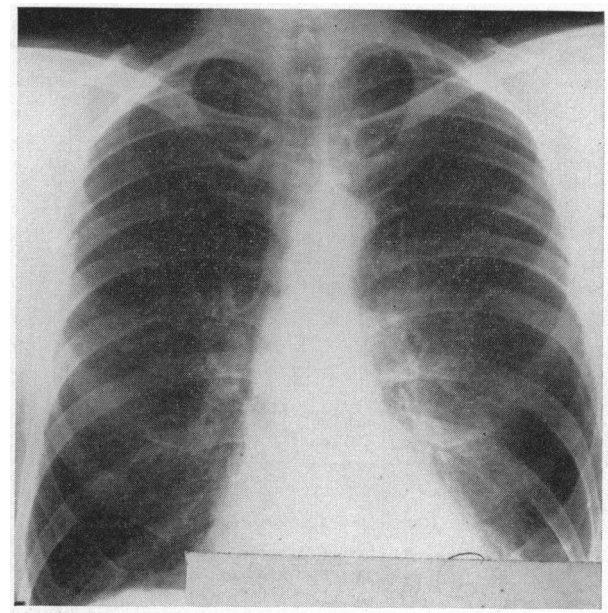

Figure 4 (Case 2).—Follow-up film of chest showing no reaccumulation of chylothorax.

plasm. In light of present experience, the patient now would be managed somewhat differently. Following the failure of repeated thoracentesis to control the reaccumulation of chyle, tube drainage with suction would be given a trial before resort to thoracotomy with ligation of the duct. If tube drainage were unsuccessful, we would now accompany thoracotomy with an operative table ductogram in an attempt to identify any accessory thoracic ducts, which occur often enough to account for the failure of this procedure in this patient.

CASE 2. The patient, a 61-year-old man, was well until, a month before admission, he noted left lower chest pain associated with dyspnea. A diagnosis of pneumonia was made and the patient was treated accordingly. Later he was admitted to the hospital, again complaining of left chest pain. An x-ray film showed left pleural effusion. Fluid was aspirated from the area and was found to be chyle (Figure 3). A diagnosis of chylothorax secondary to probably malignant invasion of the thoracic duct was made. It was elected to attempt to ligate the thoracic duct through the left chest to control the chylothorax. A periaortic mediastinal mass of tumor was encountered and the thoracic duct could not be identified. At biopsy the tumor was identified as lymphocytic lymphosarcoma. Following operation, the patient was treated with a full course of 3,000 roentgens to the mediastinum. A film of the chest three months later showed no reaccumulation of the chylous effusion (Figure 4). At last report the patient was asymptomatic and was planning to return to work.

Comment: In this case tube drainage with suction probably should have preceded the attempted ligation of the duct. Some workers in this field have recommended a trial of radiation to the mediastinum in cases of spontaneous chylothorax if conservative measures of aspiration or drainage fail. Had this course been followed in this patient, the chylothorax would presumably have been controlled but the actual diagnosis never made. If there is a place for radiotherapy in the treatment of chylothorax without a tissue diagnosis it would perhaps be in a patient in whom a proven site of primary malignant disease had been identified previously elsewhere in the body, as in Case 1.

CASE 3. A three-year-old white boy entered the hospital for division of a patent ductus arteriosus. Left thoracotomy was done, the ductus divided and the ends oversewn. The postoperative course was uneventful for five days. Then he was noted to have fluid in the left chest. A total of 4,455 cc. of milky fluid was withdrawn by thoracentesis in almost daily taps during the next 18 days (Figure 5). Because of failure of repeated thoracentesis to control the reaccumulation of chyle, closed catheter drainage, with suction, was instituted and a total of 75 cc. was drained in the next 24 hours. The tube was removed two days later. There was no evidence of accumulation of pleural fluid thereafter (Figure 6).

Comment: This case is fairly typical of the cases of chylothorax which occur after surgical operation on the great vessels. Although no difficulty was encountered in dividing the ductus, presumably the main duct or one of its larger tributaries was damaged at that time. The incidence of chylothorax following cardiovascular operations has been estimated at 0.5 per cent.[7] The latent period from time of injury to appearance of the pleural effusion averages from four to eight days, but may be much longer.[2,7] The delay is probably due to the fact that the chyle

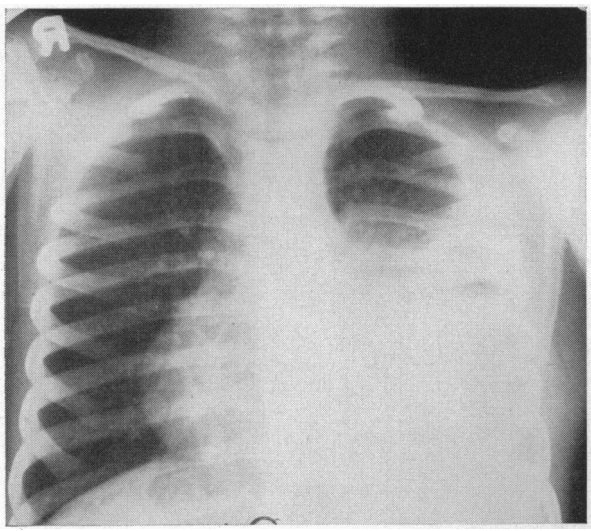

Figure 5 (Case 3).—Postoperative x-ray film of chest showing persistent left chylothorax despite repeated thoracenteses.

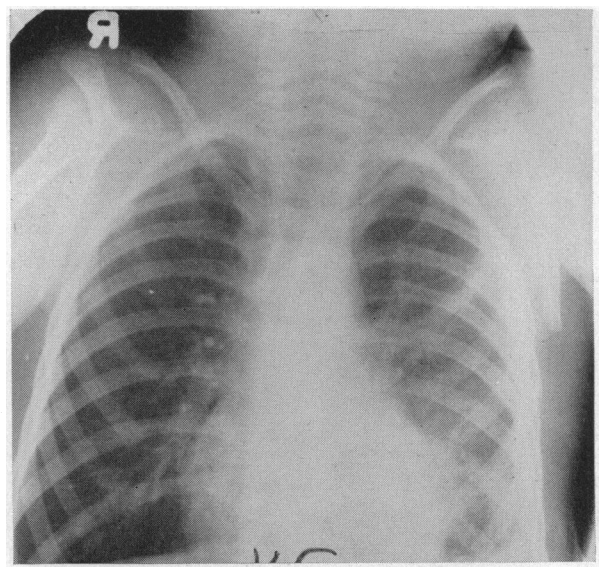

Figure 6 (Case 3).—Disappearance of chylothorax one week after closed catheter drainage.

leaks first into the mediastinum and only later breaks through the pleura into the chest. Although a lipophilic dye was not given by mouth in this case, it could have been done if there had been any question about the diagnosis. Following failure of multiple thoracentesis to control the reaccumulation of chyle, consideration was given to proceeding directly with ligation of the duct. However, in line with our present policy of first trying suction drainage before operative attack, a conservative course was followed which resulted in a rapid cure of the chylothorax.

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